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The Rationale and Design of the Taper Wheel for Use in Tapering Opioid and Benzodiazepine
Medications in Post-Operative Pediatric Patients at Home

Scholarly Project
Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts in Nursing, Nurse Educator Concentration

St. Catherine University
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Table of Contents

Abstract.....	5
Introduction.....	6
Literature Review.....	7
Need for pediatric pain management.....	7
Need for acute, post-operative pediatric pain management.....	8
Barriers to effective pediatric pain management.....	9
The role of patient and family education.....	11
Possible solutions to educating patients and families.....	11
Pediatric pain assessment.....	13
Solutions to managing pediatric pain.....	15
Withdrawal syndrome.....	17
Explanation of the Design and Purpose for the Taper Wheel.....	18
Statement of Proposal.....	19
Theoretical Framework and Healthcare Standards.....	19
Complex adaptive systems theory.....	19
Dorothea Orem's self-care deficit theory of nursing.....	20
Standards of care.....	21
Quality Improvement Study.....	21
Purpose and objectives.....	22
Study design.....	22

Methodology.....	23
Findings.....	24
Study conclusions.	26
Proposal for the Design of the Taper Wheel in Post-Operative Pediatric Pain	
Management.....	27
Proposal for the Implementation of the Taper Wheel at Gillette.....	28
Projected Benefits of the Taper Wheel.....	29
Projected Limitations of the Taper Wheel.....	31
Implications for Nurse Educators.....	32
Conclusion.....	33
References.....	35
Appendix A: Methods of Pediatric Pain Assessment.....	41
Appendix B: SWOT Analysis.....	42
Appendix C: Taper Wheel Questionnaire for Patient Families.....	43
Appendix D: Taper Wheel Questionnaire for Nurses.....	44
Appendix E: Script for Taper Wheel Study.....	45
Appendix F: Examples of Taper Wheel Designs and Worksheet.....	47
Appendix G: Questionnaire Results.....	51
Appendix H: Expected Plan for Taper Wheel Implementation at Gillette.....	59

Table of Figures**Figures**

Figure F-1: Option #1, 12-hour wheel with separate worksheet.....	47
Figure F-2: Option #2, 12-hour wheel on a base.....	48
Figure F-3: Options #3, 24-hour wheel on a base.....	49
Figure F-4: Medication Taper Worksheet.....	50

Abstract

The management of post-operative pain in children is an art and a science that has yet to be perfected. While research findings differ widely on medications, methods, and timing of interventions to manage post-operative pain, one finding is consistently reported: the treatment of pediatric post-operative pain is suboptimal (Corizzo, Baker, & Henkelmann, 2000; Dowden, McCarthy, & Chalkiadis, 2008; Kavanagh, Watt-Watson, & Stevens, 2007; Vadivelu, Mitra, & Narayan, 2010; Zhang, Hsu, Zou, Li, Wang, & Huang, 2008). Reasons for this deficiency originate in biases of clinicians and parents, difficulties in assessing pain due to variances in physical and developmental levels of children, and lack of research in best practices for pediatric pain management. Because hospital stays are reduced, parents or caregivers must often manage this pain at home. Therefore, educating these primary caregivers in the safe, effective use of pain medications, the reduction of side effects, and the appropriate tapering of the medications is paramount. It is also complex and multifaceted. Preferred methods of patient education are under much scrutiny and the needs of this group of learners are extensive. It is not enough to teach on just the cognitive level. Psychosocial, cultural, and environmental factors impact both the learning and the perceived need for managing children's post-operative pain management at home. Therefore, when educating caregivers on this important task, a learning device that addresses these barriers and provides a simple guide for medication management appears to be a promising solution. This paper presents such a learning device, designed for the purpose of assisting parents in the timing, the dosing, and, ultimately, the elimination of opioid and antispasmodic medications for their children at home. This tool is called the Taper Wheel.

Gillette Children's Specialty Healthcare Center (Gillette) in St. Paul, Minnesota provides specialized care to children and adults with disabilities and complex medical conditions. Gillette has recognized expertise in neurology, neurosurgery, and pediatric orthopedics and specializes in physical medicine and rehabilitation, cerebral palsy, and craniofacial surgery. Gillette provides a full range of services including inpatient, outpatient, rehabilitation, therapy, imaging, and surgery. Of course, ancillary departments and support services provide a full spectrum of care for patients and families. In 2010, U.S. News & World Report named Gillette among its America's Best Children's Hospitals for a second year, ranking the pediatric orthopedic specialty as 17th in the nation. The Minneapolis Star Tribune regularly ranks Gillette among Minnesota's top workplaces (Gillette, 2012). Yet, even in this caring and respected institution, opportunities exist for improvements in optimizing the specialty care provided at Gillette, as knowledge and best practices are identified.

One such opportunity is the patient education provided for outpatient pain management. Both families and staff have noted that education provided to patients after two especially complex procedures performed at Gillette required clarification and simplification: spinal surgeries and Single Event Multiple Level Surgery (SEMLS) procedures. Spinal surgeries primarily consist of spinal fusions and SEMLS are orthopedic procedures in which generally two surgeons operate on at least two limbs simultaneously for the purpose of reducing the total number of surgical procedures. The need for educational revamping was identified from inquiries to the hospital telehealth department, calls to surgeons' resource nurses, data from post-discharge calls, and feedback from representatives who serve on the Family Council. In order to address this issue, the members of the Outpatient Pain Committee spent over a year gathering data, interviewing staff and patients, and developing a plan to create and implement a new

Outpatient Pain Management Protocol (OPMP). This committee was charged to focus on several aspects of discharge educational materials in an effort to simplify these materials for caregivers. This paper focuses on one aspect of these discharge materials: the timing and tapering of opioid and benzodiazepine medications. To support this effort, this author developed the Taper Wheel. This paper will discuss the rationale for its creation, a Quality Improvement (QI) study conducted to improve its design, and a proposal for its implementation at Gillette.

Literature Review

A thorough literature review was performed to provide evidence-based support for the Taper Wheel, its need, and its design. A plethora of articles and books was reviewed to identify trends and a saturation of repeated information relevant to the development of the tool. Data are categorized and discussed for this paper. Key words used for the literature review included pain management, pediatric, tool, tapering, opioid, benzodiazepine, and patient education.

Need for Pediatric Pain Management

“Children are at unique risk for the undertreatment of pain because they lack the verbal ability and personal power to demand adequate pain management, and they often do not understand the reason for their suffering” (Cohen, 2007, p. 198). This increased risk poses the single greatest reason for focusing on pain management for this special group of patients. Compounding this risk is the special needs status of many of the patients at Gillette, including communication and cognitive deficits, mobility constraints, and, for many, frequent experiences with pain due to the necessity of repeated and ongoing interventions.

The three primary types of pain are nociceptive, inflammatory, and pathological (Woolf, 2010). The post-operative pain generally referred to in this paper is inflammatory pain. Inflammatory pain “assists in the healing of the injured body part by creating a situation that

discourages physical contact and movement . . . which reduces further risk of damage and promotes recovery” (Woolf, 2010, p. 3742). According to Woolf, this type of pain is activated by the immune system and although considered adaptive, reduction in this pain is still vital. Untreated or poorly controlled pain can acutely lead to tachycardia, hypertension, decrease in alveolar ventilation, insomnia, and poor wound healing (Vadivelu, Mitra, & Narayan, 2010). Unrelieved acute pain can lead to chronic complications such as chronic pain, sustained changes in central neural functioning, and psychological problems such as heightened pain intensity, anxiety, and post-traumatic stress (Kavanagh, Watt-Watson, & Stevens, 2007). According to Zhang et al. (2008), inadequate treatment of pain contributes to higher rates of complications, lower quality of life, and significant financial consequences. Stewart, Ricci, Chee, Morganstein, & Lipton (2003) report that pain is the “most common reason people present for health care, pain costs society billions of dollars annually, and pain can have a widespread impact on all aspects of life” (p. 197; as cited in Cohen, 2007). Despite its recognized significance and the volumes of research dedicated to its management, pain continues to be undertreated especially in children (Cohen).

Need for Acute, Post-Operative Pediatric Pain Management at Home

According to Rony, Fortier, Chorney, Perret, and Kain (2010), outpatient pediatric surgical procedures constituted 84% of pediatric surgeries in the United States and this is a trend that is expected to grow. For these surgeries, parents or other caregivers are expected to manage their children’s pain at home (Rony et al., 2010). As hospital stays following inpatient surgeries become shorter, parents of these children must also learn to manage post-operative pain at home in a shorter period of time. While children are hospitalized, staff use a multimodal approach to pain management employing such techniques as local and regional analgesia, intravenous and

intramuscular pain medications, patient controlled analgesia (PCA) techniques, continuous epidural anesthesia and multiple adjunctive agents. Parents at home do not have access to most of these modalities (Verghese & Hannallah, 2010). Therefore, the medications and non-pharmacological techniques for managing post-operative care at home must be used to their utmost effectiveness in order to manage this pain. Since most of these caregivers are not health care professionals, these parents must be taught to be skilled caregivers and knowledgeable pharmacological providers for their children after discharge.

A study conducted by Rony et al. (2010) reported that parents gave subtherapeutic analgesic doses 70% of the time at home and 58.8% of the children received less than the recommended daily dose of pain medication. Because this problem is so pervasive, Czarnecki, Garwood, and Weisman (2007) report that “pediatric postoperative patients are at risk for substantial, unrelieved pain at home” (p. 160). This pain can lead to multiple physical and psychological complications.

Barriers to Effective Pediatric Pain Management and Education

Potential reasons for why pediatric pain is suboptimally managed at home have been suggested in the literature. Barriers to effective home pain management for children are numerous and multifaceted. For example, barriers can be found in parental knowledge and attitudes, patients’ abilities to communicate and recognize pain, educational deficits, cultural beliefs, and provider attitudes and preferences. Christophersen (2001) cites the following reasons for inadequate pain management in children:

- Inaccurate pain assessment by adults
- Inadequate follow-up assessment of pain control
- Misconceptions about how children experience pain

- Inconsistencies between standardized and individualized treatments
- Unobserved intermittent pain episodes
- Poor caregiver communication
- Tapering of pain medications despite evidence of pain
- Overestimation of medication efficacy
- Misconceptions regarding drug safety
- Expectation of pain following surgery as “normal”
- Inaccurate beliefs that effective pain management is achievable
- Cultural values regarding pain and its treatment
- Reluctance by parents to ask questions or contact staff
- Inability of some children to effectively communicate pain
- Reluctance in some children to report pain.

These obstacles pose a significant impediment to managing pediatric pain and overcoming them requires further investigation.

Findings reported by Tait, Voepel-Lewis, Snyder, and Malviya (2008) suggest that it is difficult to determine the informational needs of the patient or parent and their teaching requirements. This study evaluated parents’ perceptions of the nature, timing, adequacy, and understanding of information given regarding post-operative pain control. Results indicated a wide variability in content and quantity of the amount of information given to parents. Information was often related specifically to the method of post-operative pain control provided (Tait et al.) and not necessarily to pain assessment, risks, benefits, or overall comfort mechanisms. These findings suggest that an accurate needs assessment is an appropriate first step in effectively managing children’s post-operative pain.

The Role of Patient and Family Education

Many of the barriers to effective management can be countered with education. This involves changing erroneous behaviors and attitudes, altering expectations to make them more realistic, increasing knowledge so that appropriate decisions are made, and providing resources when more information is necessary. According to Sutters, Savedra, and Miaskowski (2011), the primary goal of post-operative patient education is to “provide parents with the knowledge and support that will enable them to achieve an optimal level of pain management for their child and minimize side effects” (pp. 281-282). Another goal of patient education is to empower patients and their families in the caregiver role. “Patients are empowered when they have the knowledge, skills, attitude, and self-awareness they need to influence their health behaviors and situations” (Johansson, Nuutila, Virtanen, Katajisto, & Salanterä ; 2005, p. 213). According to Johansson et al., empowerment through patient education can be categorized in the following areas: biophysiological, functional, cognitive, social, experiential, ethical, and financial. However, evidence suggests that preoperative education, especially in orthopedics, does not systemically cover all these necessary aspects for empowerment, and thus, falls short of providing patients and families with these necessary tools (Johansson et al.).

Possible Solutions to Educating Patients and Families

Much has been written about preferred methods for providing patient education, but there is still no consensus on best practices for discharge teaching. This is due in part to variations in learning styles, health literacy, and a multitude of other factors that are beyond the scope of this paper. In fact, statistically correlating patient education with positive patient outcomes is difficult and rarely definitively done with research. Therefore, despite attempts to prove that education positively affects outcomes, there is still a lack of evidence on the effectiveness and

quality of patient education (Johansson et al., 2005). This is not to say that education is ineffective, but only to emphasize that multiple variables are involved and an individualized approach is necessary.

While no one method for discharge education is preferred, several methods have been tested and shown to be quite successful. One such method is the PRO-SELF© pain control program (Sutters et al., 2011). Although originally created for adults, Sutters et al. adapted this version to meet the needs of parents and children. In this pediatric program, specifically designed for parents managing their child's pain at home following a tonsillectomy, parents are taught to use an educational booklet and a timer to adhere to a prescribed medication routine. A study conducted by Sutters et al., indicated that written instructions, a timed analgesic dosing regimen, and education on strategies to facilitate medication administration all created an improved analgesic administration program at home (Sutters et al.). Sutters et al. also suggested that when parents reported a clear understanding of pain management, they reported higher levels of satisfaction and improved patient outcomes. Therefore, combining an evidence-based pain management plan with a clear educational program has been linked to improved home pain management. Of course, it would be important to assess individual attitudes and possible barriers prior to initiating an educational program. In that way, individual barriers might be identified and addressed as part of the educational process.

Other methods of patient education for pain management have also been found to be successful. In a study conducted by Czarnecki et al. (2007), advanced practice nurses created a pain management and educational program for inpatient use. Patients were then closely monitored by phone after discharge and were found to have effective pain relief at home with minimal complications. Another study investigating the impact of the Pain Education Program

(PEP) for nurses, found a significant improvement in pain knowledge and assessment skills following a focused educational training program (Zhang et al., 2008). This indicates that even when the patient or family is not the direct recipient of the instruction, education can still have a positive effect on patient outcomes.

To further complicate this issue, Tait et al. (2008), found that even with a patient education program in place, up to one third of parents claimed to have no understanding of side effects of pain medications and 14% reported “poor pain control” at home (p. 14). Tait et al. reported inconsistencies in patient teaching and that at times, important information was omitted. Conversely, the study also showed positive correlations in patient outcomes with perceived amount and clarity of information and with pain management education that was given pre-operatively. This suggests that creating an educational program that begins pre-operatively and spreads the discharge education over a period of time, rather than on the day of discharge, may be more effective.

Pediatric Pain Assessment

Given the complexities of managing pediatric pain, it is easy to see that the assessment of pediatric pain is equally complex. Several well-established measures have been developed and evaluated and found to be useful in managing pediatric pain. These allow for varying means of assessment as well as provider preferences and situational appropriateness. A recent literature review by Cohen et al. (2007) found 17 measures used specifically in pediatric pain. Of these, five were pain intensity self-reports, eight were observational instruments, and four were questionnaire and diary formats. (A list of these pain assessment scales can be found in Appendix A.) According to Cohen et al. (2007), the preferred assessment tool depends on the

purpose, the types of questions to be asked, and the context of the assessment. The tool should always be research based.

Another way to assess pain is through functional disability, emotional functioning, and quality of life (Cohen et al., 2007). Because these variables are difficult to quantify in terms of response to intervention, tools that measure these variables are especially difficult to validate and therefore are infrequently used. Assessments that incorporate racial and ethnic differences are being developed but are not in frequent use. However, the need for these pain assessments has become apparent.

A relatively significant number of patients at Gillette are non-verbal or have delays in their verbal communication abilities. Assessing pain in these patients takes on an even greater challenge for caregivers, but is one that must be addressed. According to Parker and Belew (2011), the two most commonly used pain assessment measures in non-verbal individuals are the Noncommunicating Children's Pain Checklist (NCCPC) and the Faces, Legs, Activity, Cry, and Consolability (FLACC) scale. These are both observational pain assessment instruments that use a standardized checklist to rate the child's pain intensity. However, pain responses can have an idiosyncratic nature that might only be identified by a close, consistent caregiver. Two types of tools have been developed that create an individualized pain assessment tool specific to each child. These tools are the Disability Distress Assessment Tool (DisDAT; Regnard et al., 2007) and the Tailored Observational Pain Screen (TOPS; Parker & Belew, 2011). Both tools have been studied and show promise in providing close caregivers a method of sharing their intuitive knowledge about their patient's pain with other caregivers.

Since the ultimate goal of a pain assessment is to identify the presence of pain, estimate its intensity, and evaluate the effectiveness of interventions (Baulch, 2010), almost any tool that

can accomplish these goals is worth investigating. In pediatric pain assessment, the role of the parent or primary caregiver in accurately assessing the child's pain cannot be overestimated.

Solutions to Managing Pediatric Pain

The management of pediatric pain is interdependently complex. Various components such as education, family and provider biases, underlying differences in individual pain, cultural differences, and more are all interwoven into a puzzle that must be sorted and pieced together. A final piece of this puzzle involves the actual pain medications, their dosing, and timing for postoperative pain management at home. This paper offers several evidence-based suggestions for this type of pain.

In 1986 (and revised in 1997), the World Health Organization (WHO) developed an analgesic ladder for pain management based on recommendations of an international group of experts. With some slight modifications, this ladder is still considered the “cornerstone . . . for the correct use of analgesics to make the prescribed treatments effective” (Vargas-Schaffer, 2010, p. 514). Although developed for cancer-related pain, it is now used for acute and chronic pain in any patient that requires analgesics. The five parts of the WHO ladder are:

1. Use the oral form of the analgesic.
2. Give analgesics at regular intervals.
3. Prescribe analgesics according to pain intensity based on pain assessment.
4. Provide analgesic dose based on the individual.
5. Prescribe analgesic with a regularity of administration. (Vargas-Schaffer, 2010)

In 2005, the American Pain Society (APS) revised its original 1995 Quality Improvement Guidelines for the Treatment of Acute Pain and Cancer Pain (Gordon et al., 2005) to improve the quality of pain management in all care settings. After a systematic review of published studies

and the input of over 3000 APS members and additional experts, the task force made the following recommendations for improving pain management (Gordon et al., 2005):

1. Recognize and treat pain promptly (emphasis on comprehensive assessment and the importance of preventive and prompt treatment).
2. Involve patients and families in pain management plan (emphasis on customization of care and participation of patient in the treatment plan).
3. Improve treatment patterns (eliminate inappropriate practices, provide multimodal therapy).
4. Reassess and adjust pain management plan as needed (respond not only to pain intensity but to functional status and side effects).
5. Monitor processes and outcomes of pain management (standardized quality indicators).

The new recommended quality indicators for patient outcomes of pain management identified by the APS task force include:

1. Pain intensity is documented with a numeric or descriptive rating scale.
2. Pain intensity is documented at frequent intervals.
3. Pain is not treated intramuscularly.
4. Pain is treated with regularly scheduled analgesics. A multimodal approach is used whenever possible (combinations of techniques).
5. Pain is prevented or controlled to increase function and quality of life.
6. Patients are adequately informed about pain management. (Gordon et al., 2005)

Additional research findings and recommendations for pediatric pain management call for dosing guidelines that promote the maintenance of therapeutic blood levels of analgesic and the prevention of pain when possible (Smyth, Toombes, & Usher, 2011; Sutters et al., 2010;

Verghese & Hannallan, 2010). In other words, scheduled or around-the-clock (ATC) dosing is preferred to pro re nata (PRN) because it has been found to be more effective in reducing pain intensity. Sutters et al., (2010) found that while there was an increase in the analgesic quantity given to the ATC group over the PRN group, there were no differences in frequency or severity of opioid related adverse effects, with the exception of constipation. Other studies have also demonstrated the increased efficacy of this dosing schedule with an insignificant impact on side effects.

Withdrawal Syndrome

The issue of withdrawal symptoms for any patient on an opioid or benzodiazepine medication must be taken into consideration. Withdrawal syndrome is “a characteristic pattern of unpleasant signs and symptoms that typically follows abrupt cessation of drugs with central nervous system depressant effects” (Franck, Naughton, & Winter, 2004, p. 345). Predominant characteristics of this syndrome include nervous system hyperirritability, autonomic dysregulation (sneezing, yawning, sweating, tachycardia), gastrointestinal dysfunction, respiratory distress, and abnormal motor movements. Studies have documented withdrawal syndrome in infants and children since the 1980s and symptoms have been seen in patients on as few as five days of ATC opioid and benzodiazepine regimens (Franck et al., 2008). There is no current consensus on how opioid and benzodiazepine medications should be discontinued to prevent withdrawal syndrome or how this syndrome should be treated (Franck, Naughton, & Winter, 2004). However, a tapering management protocol is recommended for gradual discontinuation of these medications to lessen withdrawal symptoms. A tool called the Withdrawal Assessment Tool-Version 1 (WAT-1) has been developed for monitoring opioid and benzodiazepine withdrawal symptoms to aid in this task (Franck et al.).

Explanation of the Design and Purpose for the Taper Wheel

As a leader in pediatric orthopedic surgery, Gillette has identified the need for clarification and simplification of some of its patient educational materials. This is especially true for patients undergoing spinal fusion and SEMLS procedures where pain and muscle spasms are significant issues. Most of these patients receive very adequate pain control during their hospital stay, usually with an epidural opioid medication. After a few days, patients are transitioned to oral narcotic medications (oxycodone or percocet) and antispasmodics (valium, vistaril). While this is a complicated medication schedule, it is controlled by the nurses and most patients report good pain control during their hospital stay. The problem arises when patients are sent home, as they commonly are, on these medications. The majority of spinal fusion and SEMLS patients go home on oxycodone (every 4 hours), Tylenol (every 4 hours, but not more than 5 doses in 24 hours), valium (every 4 to 6 hours), and vistaril (every 6 hours) in addition to their other medications. Current education consists of providing families with a packet of written papers about the medications, follow-up appointments, physical restrictions, cast care, and dietary and bathing instructions. In addition, the inpatient nurses provide verbal instructions. Yet given the volume of information and the time limitations of the nurses, it is not difficult to imagine why many families have difficulty understanding and maintaining this complex medication schedule.

The Taper Wheel and associated worksheet were created by this author with the aim of providing effective and safe acute post-operative pain management to children in their homes with the primary goals of reducing pain and discomfort; maximizing health and function; and minimizing complications and side effects. An important secondary goal is tapering off the pain and antispasmodic medications in a safe manner. The Taper Wheel is a simple, hand-held device

that assists patient families in planning medication times and helps them to reduce pain medication usage over time. It is especially designed for use with opioid and benzodiazepine medications. It looks like the face of a clock with two inner wheels, one for pain medications and one for spasm medications. Its purpose is to calculate medication times and doses in a 12 or 24-hour period with the goal of extending the times of administration gradually. A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was performed by this author as part of an implementation proposal for this tool (see Appendix B). The purpose of the SWOT analysis was to identify the internal and external factors that will effect the implementation of the tool.

Statement of Proposal

Based on the review of literature and research, I propose the inclusion of the Taper Wheel in discharge educational materials for patients going home on analgesic medications at Gillette. Rationale for this proposal and the creation and design finalization of the Taper Wheel are outlined in this paper.

Theoretical Framework and Healthcare Standards

Complex Adaptive Systems Theory

The theory that best provides a framework for this proposal is the complexity theory of complex adaptive systems (CAS). The implementation of the Taper Wheel meets the criteria for a complex system as outlined by Cilliers (1998):

1. System consists of a large number of elements.
2. Elements must have dynamic interactions.
3. Interactions must be non-linear.
4. System processes have recurrency (or feedback loops).
5. System is open in that it interacts with the environment.

6. System operates far from equilibrium.
7. System has a time dimension (history).
8. Each element of the system is ignorant of the behavior of the system as a whole.

Using CAS, change is a result of the interconnections between groups (inpatient staff, providers, telehealth, applicable committees) and individuals (patients and families, nurses, researchers, managers, individual members of groups) from which desired behaviors emerge (Penprase & Norris, 2005). Change is derived from within and not mandated by external sources or tradition. Spontaneous ideas and behaviors can emerge most notably in small groups and departments and thus a process of self-organization emerges. With feedback from a variety of end-users, adaptations can be made to the Taper Wheel so that this tool and the systems change process required to implement it meet the needs of patients and families. Final outcomes are impossible to predict and linear processes are non-existent but an eventual “creative adaptation” (Holden, 2005, p. 651) is expected. Instability is offset by trust in the abilities of the agents and support of the overall goal. According to Holden, the purpose of applying CAS in hospital settings is to build collaborative relationships as the key method of problem solving. Certainly, collaboration is an integral part of this quality improvement design study.

Dorothea Orem’s Self-Care Deficit Theory of Nursing

The self-care deficit theory of nursing, developed by Dorothea Orem (2001), provides a conceptual basis for the proposal of the Taper Wheel. Nursing actions to teach parents how to manage their child’s pain at home and the actions of these parents to provide pain management were viewed as components of this general theory of nursing. According to this theory, self-care (or dependent care) is a learned activity that is deliberately performed in conformity with the requirements of the individual. The theory provides a method of formalizing knowledge about

what individuals need to do for themselves or have done for them in order to maintain health and wellness (Taylor, 2006). This theory and its theoretical assertions have achieved significant acceptance in the nursing community.

Standards of Care

A plethora of standards and guidelines exists among international, national, state, and organizational bodies for the purpose of improving pain management. Some of these standards were used in the design and implementation of the Taper Wheel, including the American Pain Society's Recommendations for Improving the Quality of Acute and Cancer Pain Management (Gordon et al., 2005) and the Child-Friendly Healthcare Initiative (Southall et al., 2000). The Joint Commission Standard PC.02.03.01 which mandates that hospitals provide patient education and training based on each patients needs and abilities was used as the standard for patient education (The Joint Commission, 2009). Finally, the *Code of Ethics for Nurses with Interpretive Statements* (American Nurses Association, 2001) and the *Nursing: Scope and Standards of Practice, 2nd Edition* (American Nurses Association, 2010) were used as standards for nursing practice.

Quality Improvement Study

An initial Taper Wheel design was created by this author and was used in preliminary proposals and discussions. However, it quickly became clear that there were several potential design versions that could be created. Discussions were held among nurses and other health care providers at Gillette to determine which design might be most clear, simple, and easy to use. No consensus could be reached. It was determined that a preferred route would be to ask parents for their opinions on the tool and thus, a QI study was developed. It was also decided that the nurses

on the orthopedic unit could also provide valuable input into the tool's design, since they worked with these patients and taught home pain management regularly.

Purpose and Objectives

The purpose of the QI study was to determine the preferred design of the Taper Wheel in order to ensure its simplicity and potential for use. A secondary purpose was to determine whether or not the Medication Taper Worksheet would be a useful tool and if it would be used in conjunction with the wheel. Objectives for the family portion of the study were to (a) identify initial thoughts about using the tool, (b) determine whether or not it would be a useful tool at home, (c) identify aspects of the wheel that might be unclear, (d) obtain recommendations for design elements that would improve clarity and function, (e) determine whether or not families would use the wheel and the worksheet separately or together, and (f) select a preferred overall wheel design. Objectives for the nurses' portion of the study were to (a) obtain feedback on the general idea of the tool, (b) determine potential barriers to the use of the tool by the nurses, (c) obtain recommendations for design elements that would improve clarity and function, (d) determine whether or not the nurses believed the tool would actually be used, and (e) select an overall wheel design.

Study Design

A qualitative research design was used for this study since numbers and quantitative data could not adequately reflect the rich feedback expected from families as the potential end users. For this study, two questionnaires were developed, one for the patient families and one for the nurses. The nurses' questionnaire consisted of eight questions while the families' was slightly different with 10 questions (see Appendices C and D). A script was also created for use in approaching potential families to ensure that this would be done in a consistent and

noncompulsory manner (see Appendix E). Study participants were interviewed and responses written on the questionnaire by the researcher. No names or other identifying indicators were used.

The following inclusion criteria were established for patient families. Charge nurses on the orthopedic unit determined daily patient eligibility.

- Patients were current inpatients on the orthopedic unit.
- Patients were scheduled to be discharged on a complex pain management protocol such as previously described.
- Patients may or may not have had previous experience with this pain management protocol.

Inclusion criteria for nurses was current employment as an inpatient nurse on the Gillette orthopedic unit or recent past employment. All study participants were English speaking, but this was not a requirement if interpretation services were available. Anyone not associated with Gillette or not meeting the inclusionary requirements was excluded from the study.

Methodology

Total population of nurses invited to participate in the study was 13. Of those invited to participate, all agreed (100% participation). Twenty families were approached to participate in the study and 18 agreed (90% participation). Therefore, a total of 13 nurses and 18 family members were interviewed between March 25-April 14, 2012. All interviews took place on the inpatient orthopedic unit during either the day or evening shifts. Interviews lasted from approximately 10 to 35 minutes, with the nurses taking considerably less time than the families. For all families, medication uses and probable time schedules were explained which accounted for at least some of the extended time of the interviews.

For both nurses and families, a brief explanation of the tool was given and then participants were asked the questions on the questionnaire. All participants were shown the tools in numerical order, #1-#3. The researcher recorded responses on the questionnaire. Towards the end of the interview, participants were asked to select their preferred Taper Wheel. Taper Wheel #1 was a 12-hour wheel with a separate worksheet, Taper Wheel #2 had the 12-hour wheel attached to a base with the worksheet attached to the back, and Taper Wheel #3 was a 24-hour wheel on a base with the worksheet on the back. (See Appendix F for the three Taper Wheel options and the worksheet.)

Findings

A comparison of the questionnaire responses for the nurses and patient families indicates areas of both congruence and variance. A complete comparison of all responses to the interview questions is included in Appendix G.

Nurses' responses to the questions indicated, as expected, a thorough understanding of the medications, their uses, and the need for a tapering schedule. Because of this, lengths of the interviews were reduced. The nurses were evenly split on the estimated length of time it would take to teach the Taper Wheel, with about half estimating less than 5 minutes and the other half estimating 10-15 minutes. Many nurses stated that time spent would be dependent on the families' current knowledge and previous experience with the medications. Most nurses (70%) believed that the most appropriate time to introduce the Taper Wheel was when the patient was switched to oral analgesics as an inpatient. This would give the families time to use the Taper Wheel and "practice" while having the nurse actually giving the medications and acting as a guide. A few nurses did express concern that the families might be "on the call light" at the exact minute the medication was due, but this was not an overwhelming concern.

The nurses indicated that the markings and colorings were generally clear and understandable, but there were recommendations for further clarity. Some nurses believed the wheel and the worksheet should be connected to reduce the chance that one might be misplaced. Several nurses indicated that on the 24-hour model, the day hours should be on top and the night hours on the bottom. Other suggestions for improvements included making the pain and spasm wheels different colors, making the red lines and arrow thicker, writing “start” by the arrow, and removing the small numbers near the lines, since the key could be used for this.

Most nurses (92%) felt at least 50% of the families would use this tool for their child’s home pain management. However, the preferred tool lacked a clear consensus: 38% of the nurses preferred Taper Wheel #1 and 31% were split between #2 and #3. It seemed to be mostly a matter of personal preference for the nurses, but it should be noted that most of the nurses expressing a preference for either of the 12-hours wheels voiced a strong dislike for the 24-hour wheel. Many voiced that the 24-hour model would be “overwhelming” or “confusing” for the families. General comments regarding the tool were favorable, supportive, and indicated willingness for use.

Exactly half the families interviewed were experiencing their first time with a major surgery and the assumption of responsibilities for home pain management. The other half had some experience with home pain management and for one patient, this was his 12th surgery. Most families (61%) believed the tool looked simple and understandable, but all required explanation of its use. Almost half (44%) of the family participants took between 1 and 5 minutes to grasp the concept while 50% took between 6 to 10 minutes. As expected, families who had experience with home pain management took the least amount of time since they did not require the detailed explanations of the medications and timing schedules.

All participants believed that the pain and spasm wheels should remain separated for ease in medication and timing differentiation. Most parents believed the colors and markings on the tool were clear overall, but many offered recommendations to enhance these distinctions. The suggestions included (a) writing the names of the medications on the wheels with a dry erase marker, (b) making the wheels different colors, (c) using the same color for the lines and the little numbers next to the lines, (d) adding a bowel movement column to the worksheet, and (e) laminating all the wheels. Almost 90% of the parent participants indicated they would use the tool at home, with two parents asking if it was already available for use. Two parents stated they would probably not use the tool because their children were on many medications prior to the surgery and that a system was already established at home for medication administration. All respondents indicated that they would use the Medication Taper Worksheet at home.

The 24-hour wheel was selected by 56% of the family participants as their preferred choice. Most indicated a need for “thinking in terms of 24 hours” as well as the elimination of some confusion about the 5-hour interval timing on the 12-hour wheel. However, with 45% of the families choosing the 12-hour wheel (either with or without a base), one design was not strongly preferred over the other. Final comments were overall positive and families seemed to agree that anything that would make pain management easier at home was worth trying. The extremely favorable comments on the Medication Taper Worksheet are worth noting.

Study Conclusions

Response to the Taper Wheel was overwhelmingly positive. The nurses and families indicated that while the tool was not intuitive, it was easily comprehensible with a brief explanation. All participants believed the Taper Wheel would be useful to most caregivers and especially multiple caregivers at home. Recommendations for design improvements were

minimal and could be easily implemented. Specific preferences by some parent participants could be implemented individually without overall design changes. Input about a preferred model was inconclusive, with strong positive responses for both the 12 and 24-hour models. However, the only model that received a negative reaction was the 24-hour one, which was immediately dismissed by several participants. Both nurses and families expressed a willingness to use the tool and a desire for its implementation at Gillette. Surprisingly, the Medication Taper Worksheet was very well received and will likely be implemented with or without the Taper Wheel.

Proposal for the Design of the Taper Wheel in Post-Operative Pediatric Pain Management

Based on the results of this QI study, I propose the implementation of the Taper Wheel and the Medication Taper Worksheet with the following design changes and suggestions:

1. Make all the wheels slightly different colors.
2. Keep the colors of the lines the same, but differentiate them more. Use a solid red line, a blue line with big circles, and a green line with triangles (similar to Wheel #2).
3. Make the red arrow bigger and put the word “Start” next to it.
4. Keep the little numbers next to the lines, but make them the same color as their coordinating line.
5. Laminate the wheels.
6. Add a bowel movement check box to the “Side Effects” column on the worksheet.
7. If the 24-hour model is selected, have the day hours on the top half and the night hours on the bottom half.

8. A new worksheet should be started every day and all worksheets should be kept until the medication regimen is completed. Enough worksheets should be sent home with the patient to complete their expected medication regimen.
9. Teaching about the tool should be initiated in the hospital when the patient is started on oral analgesics. Teaching can be done by the inpatient nurse or with a brief video that the family is given to watch and possibly even take home. The family should be completely comfortable with the tool prior to discharge. Documentation of this teaching and the family's understanding of the tool can be part of the discharge instructions.
10. Gillette nurses would require orientation to the Taper Wheel as well. This can be accomplished by staff in-services or by adding a Taper Wheel training video to the required nursing competencies.

Because of the strong feelings expressed by a few respondents against the 24-hour model, I am inclined to recommend the 12-hour model. There was no significant stated opposition to the 12-hour model. Thus, since there was only a slight preference (56%) for the 24-hour model by families and only 31% of the nurses preferred the 24-hour model, it seems that the 12-hour model was easiest for most of the families and created no real opposition. However, preference for the 24-hour wheel could be accommodated either by having two wheels for people to choose from or by having a wheel that has a 12-hour clock on one side and a 24-hour clock on the other.

Proposal for the Implementation of the Taper Wheel at Gillette

Implementation of the Taper Wheel is contingent on communication and cooperation with departments that will be impacted; these are the same departments involved in the study and design of the tool. Implementation is a multidisciplinary partnership and involves layers of

learning and communication. Bridging the gap from theory to practice can be challenging, therefore a potential implementation plan is outlined (see Appendix H).

The implementation process is expected to proceed following the rapid-cycle process improvement pathway. According to this implementation plan, the following three questions are regularly addressed (Brown & Hare, 2002):

1. What are we trying to accomplish?
2. How will we know that a change is an improvement?
3. What changes can we make that will result in an improvement?

This plan should assist stakeholders in both staying focused and in proceeding without unnecessary delays so that the best design is developed in a short period of time.

Projected Benefits of the Taper Wheel

This paper has identified some of the challenges faced by parents and other caregivers in assessing and managing post-operative pediatric pain after discharge. To recap, some of these challenges include:

- For a number of reasons, children are at risk for under treatment of pain.
- Unrelieved acute pain can lead to immediate and chronic changes in the physical and psychological well being of the child, thus impacting patient outcomes.
- Pediatric surgeries are increasingly done on an outpatient basis or with shortened hospital stays. This necessitates pain management at home after discharge by parents and coordination with other outpatient caregivers.
- Patient education regarding home pain management is often suboptimal due to the large volume of information required and limitations on nurses' time.

- Attitudinal and cultural barriers exist in patients and families as well as in nurses and providers. These may impact the learning process and the proper management of pain.
- Accurate assessment of pediatric pain is complex and additionally complicated in non-verbal patients.
- The treatment of pain is considered a basic human right and children deserve “protection from unnecessary suffering” (Southall et al., 2000, p. 1054). Ensuring this right for patients is an ongoing process that remains challenging.

The Taper Wheel, in conjunction with the Taper Medication Worksheet, was created as a tool to simplify and visualize the pain management process for parents caring for their children at home post-operatively. If used properly and consistently, this tool should maximize parents' ability to provide pain relief for their children while minimizing side effects, overdosing, and the effects of withdrawal. It uses a minimal amount of language, so issues with literacy and non-native English speakers are reduced. With slight modifications and minimal expense, it could easily be translated into several frequently used languages. It is portable and disposable, so when the caregivers no longer need it, they can simply throw it away. Conversely, it could also be saved and used repeatedly if desired or needed.

The Taper Wheel has potential applications in areas other than opioid and benzodiazepine tapering in pediatric patients. Many medications are titrated or tapered and the Taper Wheel has the potential to be used for these purposes as well. Psychiatric medications, antiepileptic drugs, and other analgesics are just a few of the medications that require weaning on or off. It could also be used as an assistive device for scheduling almost any medication that is given at regular intervals throughout the day without regard to weaning. For individuals who prefer technology, the Taper Wheel could easily be adapted as an application on a Smartphone or iPod touch® and

could even be used with a timer on these applications to remind patients of medication times. So, the conceptualization of the Taper Wheel is a prototype with multiple potential applications.

Projected Limitations of the Taper Wheel

The most significant limitations of the Taper Wheel are (a) there is no historical use to either endorse or reject it, (b) there is currently no research to validate its efficacy in patient outcomes, and (c) it will likely be difficult to correlate the Taper Wheel to actual outcomes such as decreased pain and side effects and shorter durations of analgesic use. The Taper Wheel is a new device that has not previously been used in actual practice. While it seems intuitively beneficial, it may not be helpful in actual use or there may be unanticipated problems. Therefore, a research design that uses a randomized clinical trial (RCT) or a correlational design should be pursued. This is, in fact, tentatively planned at Gillette.

In an open, non-linear system in which accurate and objective feedback is obtained, the researcher must be open to the possibility that the Taper Wheel will have no place in the new discharge educational curriculum. The purpose of evaluating the use of the tool will be to both improve and expand its use or to eliminate it as part of the new patient educational materials for outpatient pain management. Publication will be pursued at the completion of a research study.

Despite its lack of research, the Taper Wheel is evidence and theory based. The principles and analgesic measures used in the creation of the Taper Wheel are supported by research and multiple professional organizations. Several Gillette stakeholders believe that the Taper Wheel could be implemented prior to the completion of a formal study and publication. According to Allen (as cited in Kumar & Saha, 2011), “An evidence-based approach to pain management is not always possible or beneficial to the patient. In the face of inconclusive evidence, a theory-based approach may help determine if the therapeutic effect of a given

physical agent has the possibility of being a useful clinical tool in the context of treating a particular patient's mechanism of pain generation" (p. 85). Pending feedback from appropriate stakeholders such as administrators, pain content experts, and the pain committee members, the implementation of the Taper Wheel is expected at Gillette.

Implications for Nurse Educators

Nurse educators fulfill two important roles for the Taper Wheel: patient education and professional staff development. According to Standard 5B of the Standards of Professional Nursing Practice (American Nurses Association, 2010), "the registered nurse employs strategies to promote health and a safe environment" (p. 41). Providing health teaching, using appropriate health teaching methods, evaluating the effectiveness of teaching strategies, and providing information about potential adverse effects of proposed therapies are all within the scope and practice of the nurse. As nurses integrate the teaching of the Taper Wheel into the other discharge education for patients, they are fulfilling a vital nursing function.

The role of the nursing professional development specialist is also important to the complete implementation of the Taper Wheel. Before patients can be educated on the Taper Wheel, nurses must first have a thorough understanding of its use. The six standards of the nursing staff development practice include: assessment, identification of issues, outcomes identification, planning, implementation, and evaluation (American Nurses Association and National Nursing Staff Development Organization, 2010). This process, modeled after the nursing process, provides a framework for the clinical staff educators at Gillette to educate the nurses on the Taper Wheel. Using these guidelines, the Gillette clinical educators will use a variety of strategies such as in-services, intranet videos, and one-on-one coaching to teach appropriate nurses about the Taper Wheel.

The nurse educator, as a leader and role model, has a unique responsibility to advance the profession of nursing through scholarly inquiry and innovation. Provision 7.3 of the *Code of Ethics for Nurses with Interpretive Statements* (American Nurses Association, 2001) calls for “advancing the profession through knowledge development, dissemination, and application to practice” (p. 23). Standards 7-10 of the Standards of Professional Nursing Practice (American Nurses Association, 2010) promote the ethics, education, evidence-based practice, and quality of practice which support the nurse educator into pursuing new and innovative strategies for improving clinical nursing practice as well as academic nursing education. The nurse educator can act as a liaison between scholarly pursuit and research and actual nursing clinical practice.

Conclusion

The suboptimal treatment of post-operative pain in children at home is a source of needless suffering for some children and a serious concern for parents and caregivers. The Taper Wheel was developed in an effort to alleviate this suffering and anxiety by providing a means to simplify a complex medication regimen and develop a daily medication plan. A review of the literature revealed no comparable tool in use, but a substantial amount of research to support the need for such a device. A QI study was conducted to assist in creating the tool that would be the most user-friendly and to receive feedback about whether or not the tool would be used by its intended recipients. Although the sample size was small, the study participants were able to provide useful design input and recommendations. They also indicated their overall support of the tool’s use and confirmed the need for such a tool. Since these initial study findings support the tool’s design and use, a trial to evaluate the tool’s efficacy will likely be implemented at Gillette. A pilot study will follow with full implementation pending the outcomes this efficacy

study. If evaluated as successful in the target population, other uses will be pursued with the ultimate goal of safe and effective pharmaceutical administration.

From its inception as an idea to help outpatient families struggling at home with their child's pain management to the creation of a design prototype for potential use in practice, the Taper Wheel demonstrates the integration of the multidimensional roles of the nurse educator. In doing so, it provides an exemplar of one way in which the role of nurse educator can have a positive effect on nursing practice and patient outcomes.

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Appendix A

Methods of Pediatric Pain Assessment (Cohen et al., 2007)

Name	Type of Measure	Brief Description
Visual Analog Scale (VAS)	Self-Report	Horizontal line with pain markers; draw line to show pain
The Oucher	Self-Report	Photograph scale for pain intensity
Wong-Baker Faces Pain Rating Scale	Self-Report	Six faces range from no hurt to hurts worst
Faces Pain Scale- Revised	Self-Report	Six cartoon faces range from neutral to high pain
Poker Chip Tool	Self-Report	Poker chips used to rate pain intensity
Headache Diary	Diary	Likert scale used to rate pain intensity four times/day
Pain Diary	Diary	Visual analog scale assesses pain three times/day
Abu-Saad Pediatric Pain Assessment Tool (PPAT)	Questionnaire	Used 32 descriptors to evaluate pain on a scale
Varni-Thompson Pediatric Pain Questionnaire (PPQ)	Questionnaire	Assesses chronic pain via self-report
Procedure Behavioral Rating Scale (PBRs)	Behavioral Observation	Observational measure of behavioral distress
Observational Scale of Behavioral Distress (OSBD)	Behavioral Observation	Consists of eight behaviors that indicate stress
Child-Adult Medical Procedure Interaction Scale (CAMPIS)	Behavioral Observation	Observational measures used to assess pain during acute medical procedures
Procedure Behavior Checklist (PBCL)	Behavioral Observation	8 operationally defined behaviors rated on occurrence and intensity
Children's Hospital of Eastern Ontario Pain Scale (CHEOPS)	Behavioral Observation	Observed measure of postoperative pain in children
COMFORT scale	Behavioral Observation	8 behavior scales for use in ICU environments
Child Facial Coding System (CFCS)	Behavioral Observation	Measure of facial expressions during painful procedures
Premature Infant Pain Profile (PIPP)	Behavioral Observation	7 pain indicators of pain in premature infants

SWOT Analysis of the Taper Wheel as part of the redesign of discharge educational materials at Gillette Children's Hospital

Opportunities		Threats	
E	<ul style="list-style-type: none">Changes in medical reimbursement:<ul style="list-style-type: none">Reduced payments for hospital readmissions within 30 days of discharge will encourage changes that reduce readmissions.More need for outpatient pain management due to shorter hospital stays.	E	
X		X	
T		T	
E	<ul style="list-style-type: none">Gillette's reputation as an innovative leader in many specialty areas.Creating a new, simple device to assist with at home acute pain management would be added incentive for its use.Joint Commission requires that hospitals provide patient educational materials based on patient's assessed needs (The Joint Commissions, 2009).	E	
R		R	
N		N	
A		A	
L		L	

Appendix C

Taper Wheel Questionnaire for Patient Families

1. Has your loved one ever had surgery that required home pain management?
2. At first glance, what was your impression of the tool?
3. How long would you estimate it took you to grasp the use of the tool after it was explained to you? (Surveyor can estimate.)
4. Are the markings and colors clear and understandable? If not, how could they be made more so?
5. Do you understand the types and purposes of the medications this patient is on? Do you feel that the wheels could be consolidated into one, or should they be kept separate?
6. Do you have any suggestions for improving this tool?
7. Would you use this tool after your child's surgery?
8. Would you use this along with a pain/medication worksheet?
9. Which type of wheel do you prefer and why?
10. Other comments?

Appendix D

Taper Wheel Questionnaire for Nurses

1. At first glance, what was your impression of the tool?
2. How much additional time would you estimate that that teaching this tool would add to other discharge education?
3. When would be the most appropriate time to initiate teaching on this tool?
4. Are the markings and colors clear and understandable? If not, how could they be made more so?
5. Do you have any suggestions for improving this tool?
6. Do you feel families would use this tool after their child's surgery?
7. Which type of wheel do you prefer and why?
8. Other comments?

Appendix E

Script for Taper Wheel Study

GE=Gillette employee

PF=patient family member

Setting: inpatient orthopedic unit prior to discharge

GE: “Hello, my name is _____ and I work as a nurse (researcher, etc) here at Gillette. Would you mind if I took about 10 or 15 minutes of your time and showed you a new patient educational tool we may be using with some of our patients? **[If the family gives any indication of not wanting to participate, thank them for their time and leave. Otherwise, may continue.]** We’d like to see what patients and their families think about this tool these tools and get your feedback before we officially use it. Would this be a good time to talk to you? If this is not a good time, perhaps I could come back at a time that is more convenient.”

PF: Sure that would be fine.

GE: “Thank you for agreeing to help up improve our educational material. We are looking into changing some of our outpatient pain materials to ensure that all patients who go home on pain medications have safe and effective pain control. As you know, your _____(patient relationship i.e. son, daughter, foster child, etc.) will likely go home on pain medication, maybe even a narcotic pain medication. It’s quite possible that he/she will go home on more than one type of pain medication and even some medications for pain caused by spasms. Sometimes this gets to be a lot to keep track of. As you also know, these pain medications are only for short-term use and patients usually started lowered the doses within a few days. Were you aware of some of this?”

[At this point, it would be important to stop and make sure the PF is knowledgeable about what you have just told him. Perhaps this is the patient’s first surgery and they are completely unfamiliar with any of this. On the other hand, this may be the patient’s 6th or 7th procedure and they totally get it. It’s important to assess their level of experience and understanding. This is also a good time to note any language or cultural barriers they may have. Once they can meet you at this level, you can proceed.]

GE: “I’d like to show you what we call a “Taper Wheel”. It’s a way to help you plan the medications your child will be receiving each day and to help you decrease those medications in a safe way, while still keeping the patient comfortable. Here is how you can used it:

1. The wheel is set up like a clock, with 12:00 at the top.
2. You can see that on the outside of the wheel are times, going clockwise, from 12:00 all the way around to 11:00.

3. There are two wheels. The bigger wheel is for pain medication(s) and the smaller wheel is for spasm medication(s).
4. You can see that there are color-coded lines and arrows on the wheels. These indicate blocks of time. The red lines are for 4-hour time blocks, the blue lines are for 5-hour time blocks and the green lines are for 6-hour time blocks.
5. You can write the names of the medications on the wheels with a dry erase marker to help keep track of them.
6. As the times and/or dosages change, you can rewrite them as necessary.
7. To set up your medication times for the day (or night) just put the red arrow on the time that is now (or the time you want to start the plan such as the first dose after discharge). You can easily see what times the medication will need to be given in the next 12 hours. Go around the wheel again, and you'll have a plan for the next 24 hours.
8. Write down the times and doses on the worksheet and share this information with all caregivers.
9. Be sure to keep all the worksheets so that you have a record of medication doses and administration times until the patient is finished with these medications.
10. Each day, you can create a new plan based on how the patient is doing and how well his/her pain is being controlled. Remember to begin to increase the times between doses along with decreasing the amount of medication as necessary.

[Note: now that you have pretty much explained the whole process, be sure to stop here to ask if the PF needs more explanation or has questions. A brief review may be in order.]

Explain that, if implemented, the PF will be using this tool while they are still in the hospital to get comfortable with it and so that they can ask questions of their inpatient nurse as they come up.

[Final note: it is assumed prior to this teaching that the PF is familiar with the medications, uses, and side effects. If this is not the case, that teaching could be done in conjunction with the tool teaching. Proper use of this tool requires a basic knowledge of the medications.]

Please complete the questionnaire regarding the PF's response to the use of this tool.

Appendix F

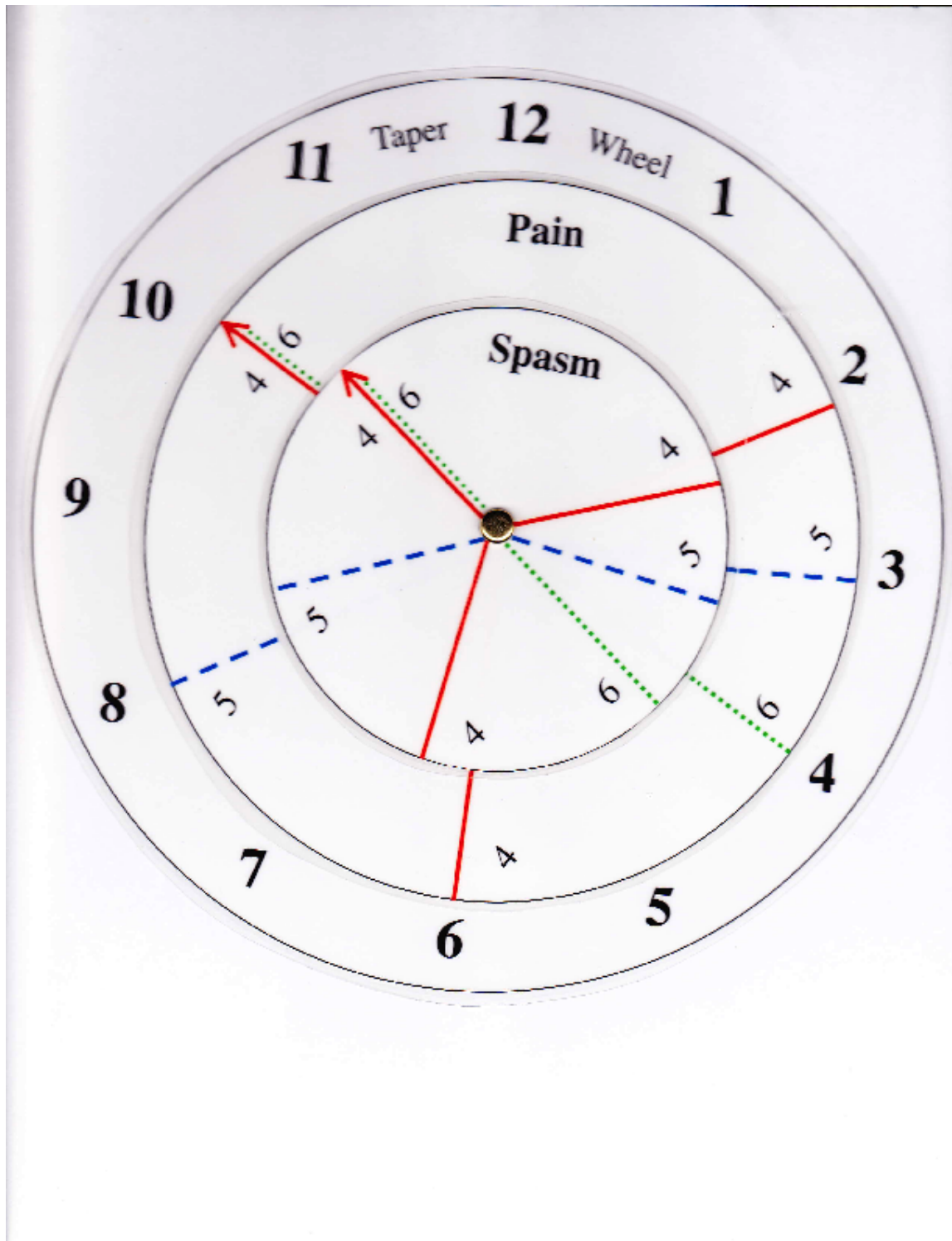


Figure F-1. Option #1, 12-hour wheel with separate worksheet.

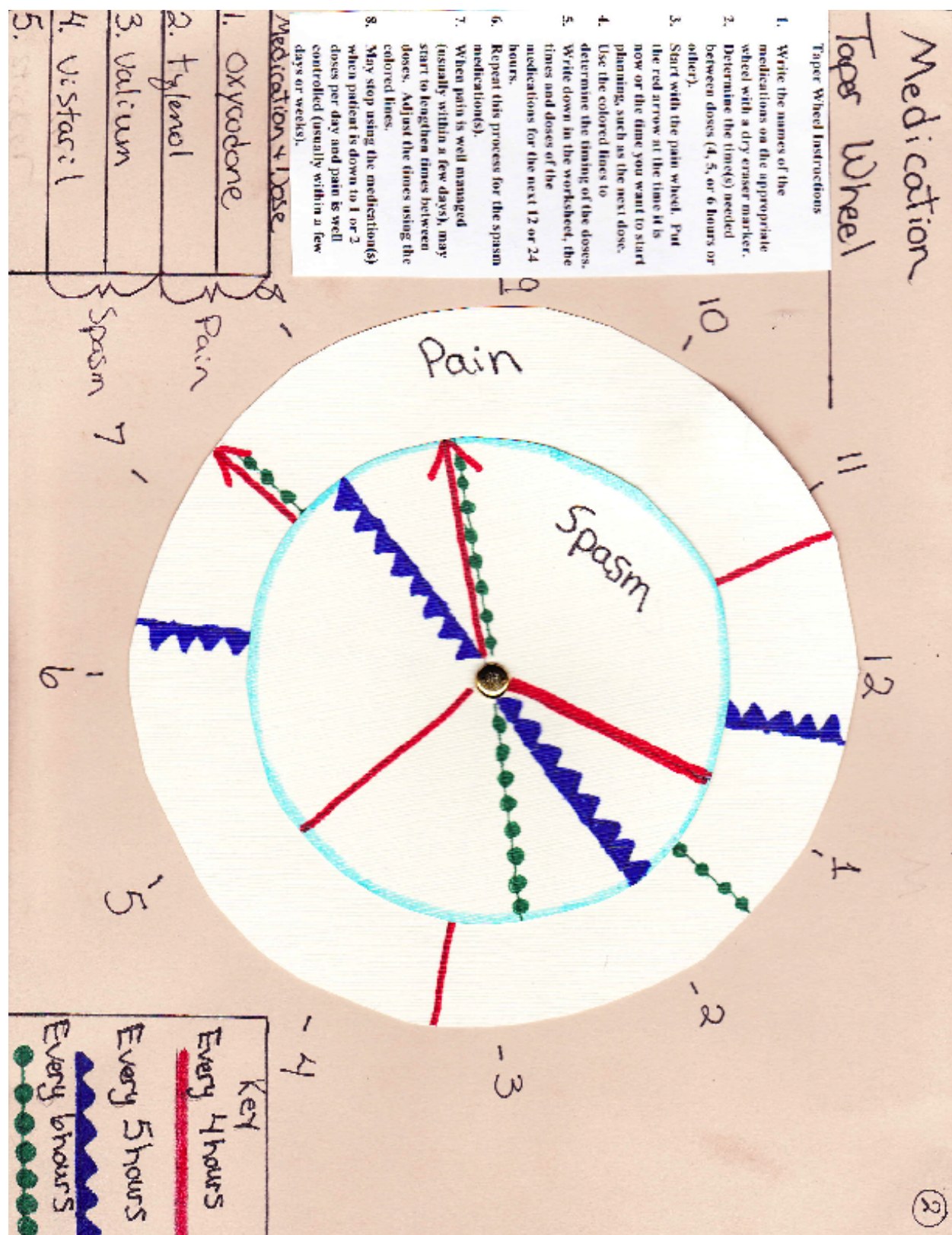


Figure F-2. Option #2, 12-hour wheel on a base.

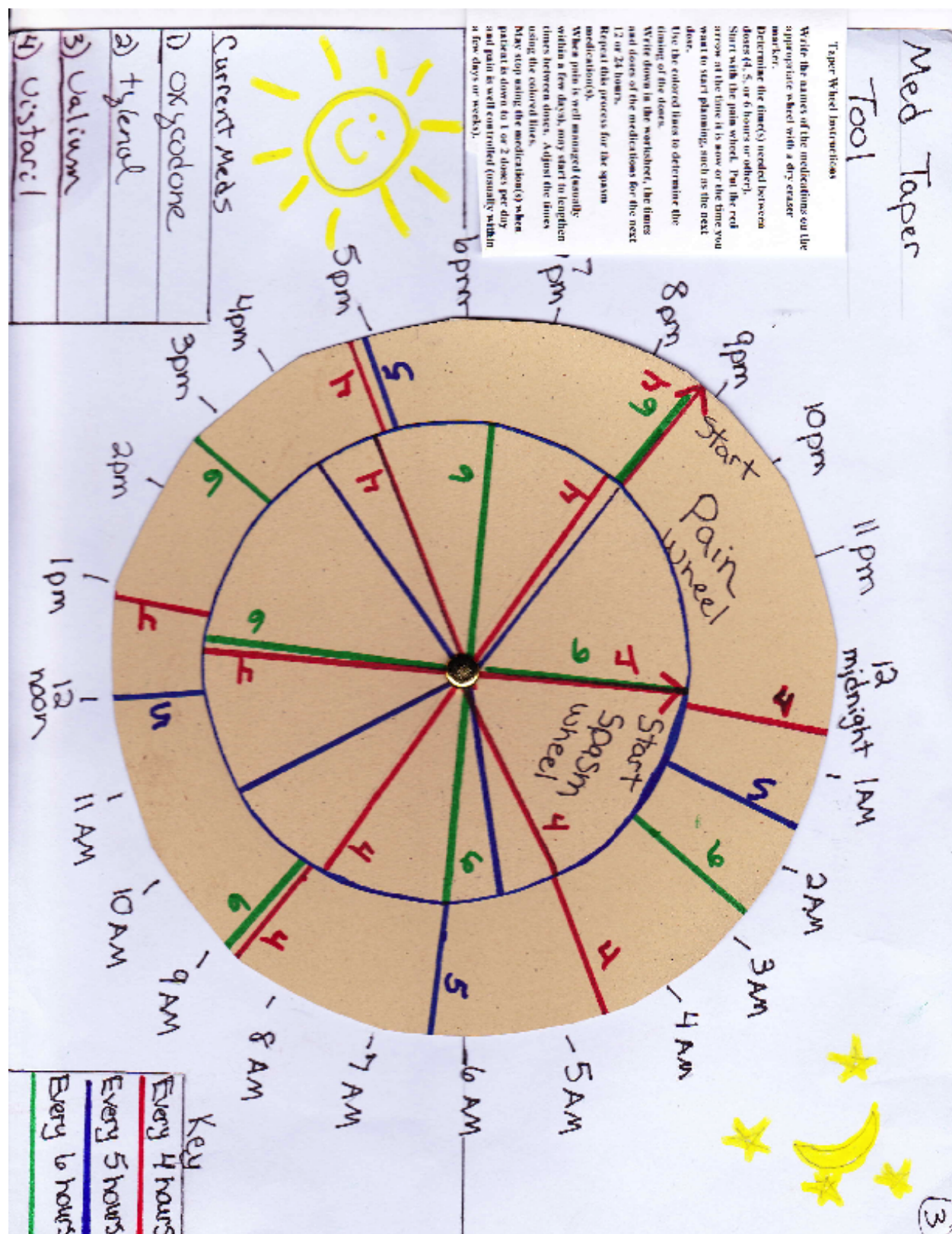


Figure F-3. Option #3, 24-hour wheel on a base.

Figure F-4. Medication Taper Worksheet.

Appendix G

Questionnaire Results: Responses to Questionnaire from Nurses (N=13)

1. At first glance, what was your impression of the tool?

Clear, simple, understandable	7	54%
Confusing or overwhelming	5	39%
Other	1	7%

2. How much additional time would you estimate that teaching this tool would add to the discharge education?

Not much/less than 5 minutes	6	46%
10-15 minutes	6	46%
A significant increase in time	1	7%

3. When would be the most appropriate time to initiate teaching of this tool?

When pt is switched to oral meds in hospital/a day or two before discharge	9	70%
With other discharge teaching	3	23%
Not pre-operatively	1	7%

4. Are the markings and colors clear and understandable? If not, how could they be made so?

Yes, no real changes to markings	9	70%
Yes, but could improve some	3	23%
Yes, but reduce differentiation and make even more simple	1	7%

5. Do you have any suggestions for improving this tool?

No real changes	4	31%
Do not separate wheel and worksheet	2	15%
For 24 hr model, put day on top and night on bottom	2	15%
Make red line thicker	1	7%
Write “start” by arrow	1	7%
Remove small numbers by lines, “too busy”	1	7%
Make wheels different colors	1	7%
Give a timeline for tapering schedule	1	7%

6. A. Do you feel parents would use this tool after their child’s surgery?

Yes	13	100%
No	0	0%

6. B. What percentage of parents would use this tool?

Between 50 and 75%	7	54%
About 50%	5	38%
Less than 50%	1	7%

7. A. Which wheel do you prefer?

#1 12 hour wheel plus worksheet	5	38%
#2 12 hour wheel on a base	4	31%
#3 24 hour wheel on a base	4	31%

7. B. Why?

#1 12 hour wheel plus worksheet	<p>“This one is not overwhelming. Don’t like #3 at all.”</p> <p>“It’s easy. Even age-appropriate kids could use this.”</p> <p>“I don’t like #3 at all. It’s too busy and confusing.”</p> <p>“Like having 2 separate pieces.”</p> <p>“This is easiest to hold and manipulate.”</p>
#2 12 hour wheel on a base	<p>“Having it all in one piece is better.”</p> <p>“It’s simplified but the right amount of information.”</p> <p>“I just like this one best.”</p> <p>“Having one piece is better.”</p>
#3 24 hour wheel on a base	<p>“There’s a lot going on, but people need to think in terms of 24 hours.”</p> <p>“People won’t get mixed up with am and pm.”</p> <p>“12 hour wheel gets confusing with 5 hour time interval.”</p> <p>“Should be on a base. 24 hours is best.”</p>

8. Other comments?

“This is a good idea. It should lessen stress on parents.”
“The key to using this is the written plan on the worksheet.”
“Very visual. It’s a good idea.”
“Like the worksheet. Would suggest keeping the meds, the wheel, and the worksheet all together.”
“This would be great for some of the trauma or short stay patients who also go home on pain meds.”
“This is a great idea. I like that the pain and spasm meds have different wheels.”
“The two wheels should be different colors. They should all be laminated. You could even have a plastic sheath to hold the worksheet in the back.”
“The names of the meds could be written on the wheels. The meds on the worksheet should be written chronologically.”
“Maybe the people who need this wheel the most wouldn’t use it. There is some confusion with the 5 hour interval on the 12 hour wheel.”
“I think the 24 hour model might be too hard to read. Wouldn’t want anyone to read it incorrectly.”
“It should definitely be laminated so it can be cleaned.”
“The red line and starting point should be more pronounced. Definitely keep pain and spasm wheels separated.”

Responses to Questionnaire from Families (N=18)

1. Has this patient ever had surgery that required home pain management prior to this?

First surgery/time needing home pain management	9	50%
Have done this at least one time before (most is 11 previous surgeries)	9	50%

2. At first glance, what was your impression of the tool?

Good, simple, understandable	11	61%
Confusing or overwhelming	7	39%

3. How long (estimated by surveyor) did it take the respondent to grasp the concept of the tool (this included an explanation of the medications and their functions)?

Between 6-10 minutes	9	50%
Between 1-5 minutes	8	44%
Less than 1 minute	1	6%

4. Are the markings and colors clear and understandable? If not, how could they be made more so?

Yes, no real changes to markings	14	78%
Yes, but could improve some	4	22%

5. Do you feel that the pain and spasm wheels could be consolidated into one, or should they be kept separate?

Keep wheels separate	18	100%
Consolidate into one	0	0%

6. Do you have any suggestions for improving this tool?

No real changes	8	44%
Write names of meds on wheels	3	17%
Make wheels different colors	2	11%
Have little number same color as the line it goes with	1	6%
Keep it all as one piece	1	6%
Should be laminated	1	6%
Add column for BM's to worksheet	1	6%
Could even add another wheel	1	6%

7. Would you use this tool at home after your child's surgery?

Definitely/Absolutely	6	33%
Yes	10	56%
No/I'm not sure	2	11%

8. Would you use this along with the Taper Medication Worksheet?

Yes, would use both together	11	61%
Yes, but I especially like the worksheet	7	39%

9. A. Which wheel do you prefer?

#3 24 hour wheel on a base	10	56%
#2 12 hour wheel on a base	5	28%
#1 12 hour wheel plus worksheet	3	17%

9. B. Why?

#3 24 hour wheel on a base	<p>“This would be especially good for nighttime dosing.”</p> <p>“Don’t have to worry about the 5 hour timing difficulty with the 12 hour wheel.”</p> <p>“You can plan out 24 hours and you’re set for the day.”</p> <p>“Plan for 24 hours and have it all in one piece.”</p> <p>“24 hour schedule is the best.”</p> <p>“24 hour wheel is the best by far.”</p> <p>“I also really like #1.”</p>
#2 12 hour wheel on a base	<p>“I like having it all in one piece. I like the 12 hours.”</p> <p>“Everything is right in front so you can see it at a glance.”</p> <p>“This is the simplest. Easiest is best.”</p> <p>“#2 is best. #3 is overwhelming.”</p> <p>“This one cuts down on all the clutter.”</p>
#1 12 hour wheel plus worksheet	<p>“This is the simplest.”</p> <p>“I like having it in two separate pieces.”</p> <p>“I don’t like having to turn it over to look at the worksheet. #3 is too busy.”</p>

10. Other comments?

"It should come with a dry erase marker for writing on the wheels."
"Good for people who like visual representations."
"The 5 hour timing on the 12 hour wheels could get confusing."
"This looks good. I would use it with the worksheet right beside it."
"I would put this in a binder and have all my discharge materials together."
"This would be a good way to organize materials at home."
"All the colors should coordinate with their times."
"The wheel is awesome. Great idea."
"I really like the side effects section of the worksheet. This is often forgotten."(2 respondents)
"I am very excited to use this. When would it be available?"
"Really good idea."
"It's easy, clear, and visible. I understood it quickly after the explanation."
"You could figure out the times by yourself, but this makes it easier."

Appendix H

Expected Plan for Taper Wheel Implementation at Gillette

1. The Taper Wheel design will be finalized following a QI interview process. An initial trial of Taper Wheels will be ordered based on the study findings.
2. The unit manager and clinical educator of the orthopedic unit will meet with members of the Outpatient Pain Committee (OPC) to discuss appropriate time frames for when the Taper Wheel will be introduced in the discharge education process. Members of the OPC will recommend that the families begin using the wheels when the patient is transitioned to oral medications in the hospital. Patients and their families will practice using the tool while still in the hospital. This will allow them to gain proficiency prior to discharge and will eliminate additional teaching required on the day of discharge.
3. The manager and clinical educator of the orthopedic inpatient unit will coordinate appropriate times, dates, and locations of brief in-services on the use of the Taper Wheel. One-on-one appointments can be arranged if necessary.
4. Staff will be given access to the instructional video as an additional reference.
5. Staff of all affected departments, such as therapy, pharmacy, providers, and telehealth, will be notified via email prior to the start date so that they will be able to provide back-up education and answer patient questions as needed. Members of the OPC will be available to attend department meetings to demonstrate the wheel if necessary. These departments will also have access to the training video. Transfer of information across departments is necessary for continuity of care.

6. A start date for initiation of the wheel will be decided upon. Staff will receive reminders as the start date draws near and samples of the wheel will be left in the nurses break room for the nurses to practice.
7. Nurses will begin using the Taper Wheel for spinal fusion and SEMLS patients as part of the discharge instruction packet. Reminders will be implemented on the unit so that the use of the wheel is initiated when oral medications are started.
8. A formal study on the efficacy of Taper Wheel and its impact on patient outcomes will be forthcoming.
9. Evaluation of the wheel will be immediate and on going. Revisions will be made as applicable.
The wheel will be formally evaluated and revised following the study.
10. If successful, the tool will eventually be used on all units for patients discharged on pharmacological pain management.